I CLAIM:

1. A system for tracking the attitude of a rotating projectile, comprising:

a transmit system mounted on the projectile, the system including first and second linearly polarized transmit antennas spaced apart by a distance d' on the projectile and third and fourth transmit antennas spaced apart by a distance d" on the projectile, first and second transmitters coupled to the first and second transmit antennas for transmitting first and second transmit signals in phase coherency at first and second different frequencies, third and fourth transmitters coupled to the third and fourth transmit antennas for transmitting third and fourth transmit signals in phase coherency at third and fourth different frequencies;

a receiver system located on the projectile's launch platform, the receiver system including a linearly polarized receive antenna system and receiver sections for receiving and downconverting said first, second, third and fourth transmit signals to provide first, second, third and fourth receiver signals; and

a processor responsive to said first, second, third and fourth receiver signals for calculating a roll angle, a pitch angle and a yaw angle.

2. The system of claim 1, further comprising first, second, third and fourth fins on the projectile on which said first, second, third and fourth antennas are mounted.

3. The system of claim 2, wherein said second and fourth frequencies are harmonics of said first and third frequencies, respectively.

4. The system of claim 3, wherein said second and fourth frequencies are second harmonics.

5. The system of claim 1, wherein distances d' and d'' are approximately equal.

6. The system of claim 1, wherein the linearly polarized receive antenna system tracks the projectile from launch to maintain a line-of-site until at or near an intended

target.

7. The system of claim 1, wherein said processor measures phase shifts between said first and second receiver signals and said third and fourth receiver signals to calculate the yaw and pitch angles.

8. The system of claim 1, wherein said processor calculates the roll angle, calculates the yaw and pitch angles in a missile frame of reference and then uses the roll angle to calculate the yaw and pitch angles in an earth frame of reference.

9. The system of claim 8, wherein said processor measures phase shifts between said first and second receiver signals and said third and fourth receiver signals to calculate the yaw and pitch angles in the missile frame of reference.

10. A system for tracking the attitude of a rotating projectile, comprising:

a transmit system mounted on the projectile, the system including first and second linearly polarized transmit antennas spaced apart by a distance d on the projectile, a first transmitter coupled to the first antenna for transmitting a first transmit signal at a first frequency, a second transmitter coupled to the second antenna for transmitting a second transmit signal at a second frequency, wherein said first frequency is different from said second frequency, and said first transmit signal and said second transmit signal are in phase coherency;

a receiver system located on the projectile's launch platform, the receiver system including a linearly polarized receive antenna system for receiving said first transmit signal and said second transmit signal, a first receiver section for receiving and downconverting said first transmit signal to provide a first receiver signal, and a second receiver section for receiving and downconverting said second transmit signal to provide a second receiver signal;

a sampler that samples the first and second receiver signals approximately ninety degrees out of phase to provide third and fourth receiver signals; and

a processor responsive to said first, second, third and fourth receiver signals for

calculating a roll angle, a pitch angle and a yaw angle.

11. The system of claim 10, wherein the processor first calculates the roll angle and a spin rate from said first and second receiver signals, said sampler sampling the first and second receiver signals at a sampling period determined by the spin rate so that said third and fourth receiver signals are approximately ninety degrees out of phase.

12. The system of claim 11, wherein the processor then calculates the yaw and pitch angles in a missile frame of reference and then uses the roll angle to calculate the yaw and pitch angles in an earth frame of reference.

13. The system of claim 12, wherein said processor measures phase shifts between said first and second receiver signals and said third and fourth receiver signals to calculate the yaw and pitch angles in the missile frame of reference.

14. The system of claim 10, wherein the second frequency is a harmonic of the first frequency.

15. The system of claim 10, further comprising first and second fins on the projectile on which said first and second transmit antennas are mounted.

16. A system for controlling a rotating projectile launched from a platform onto a target, comprising:

A launch platform for launching a rotating projectile towards a target, said platform comprising a tracking antenna for tracking the projectile to maintain a line of sight;

a projectile having a flight control mechanism mounted thereon, and a command receiver for controlling deployment of the flight control mechanism in response to command signals;

a transmit system mounted on the projectile, the system including first and second linearly polarized transmit antennas spaced apart by a distance d' on the projectile and

third and fourth transmit antennas spaced apart by a distance d" on the projectile, first and second transmitters coupled to the first and second transmit antennas for transmitting first and second transmit signals in phase coherency at first and second different frequencies, third and fourth transmitters coupled to the third and fourth transmit antennas for transmitting third and fourth transmit signals in phase coherency at third and fourth different frequencies;

a receiver system located on the launch platform, the receiver system including a linearly polarized receive antenna system and receiver sections for receiving and downconverting said first, second, third and fourth transmit signals to provide first, second, third and fourth receiver signals; and

a flight controller responsive to said receiver system for controlling the projectile in flight, the flight controller adapted to calculate a roll angle, a yaw angle and a pitch angle of said projectile while in flight from said first, second, third and fourth receiver signals and generate a command signal at an appropriate time in dependence on said roll, yaw and pitch angles, said flight controller further including a command transmitter for transmitting said command signal to said projectile.

17. The system of claim 16, wherein said flight controller calculates the roll angle, calculates the yaw and pitch angles in a missile frame of reference and then uses the roll angle to calculate the yaw and pitch angles in an earth frame of reference.

18. The system of claim 16, wherein said flight controller measures phase shifts between said first and second receiver signals and said third and fourth receiver signals to calculate the yaw and pitch angles in the missile frame of reference.

19. A system for controlling a rotating projectile launched from a platform onto a target, comprising:

A launch platform for launching a rotating projectile towards a target, said platform comprising a tracking antenna for tracking the projectile to maintain a line of sight;

a projectile having a flight control mechanism mounted thereon, and a command

receiver for controlling deployment of the flight control mechanism in response to command signals;

a transmit system mounted on the projectile, the system including first and second linearly polarized transmit antennas spaced apart by a distance d on the projectile, a first transmitter coupled to the first antenna for transmitting a first transmit signal at a first frequency, a second transmitter coupled to the second antenna for transmitting a second transmit signal at a second frequency, wherein said first frequency is different from said second frequency, and said first transmit signal and said second transmit signal are in phase coherency;

a receiver system located on the projectile's launch platform, the receiver system including a linearly polarized receive antenna system for receiving said first transmit signal and said second transmit signal, a first receiver section for receiving and downconverting said first transmit signal to provide a first receiver signal, and a second receiver section for receiving and downconverting said second transmit signal to provide a second receiver signal, and a sampler that samples the first and second receiver signals approximately ninety degrees out of phase to provide third and fourth receiver signals; and

a flight controller responsive to said receiver system for controlling the projectile in flight, the flight controller adapted to calculate a roll angle, a yaw angle and a pitch angle of said projectile while in flight from said first, second, third and fourth receiver signals and generate a command signal at an appropriate time in dependence on said roll, yaw and pitch angles, said flight controller further including a command transmitter for transmitting said command signal to said projectile.

20. The system of claim 19, wherein the processor first calculates the roll angle and a spin rate from said first and second receiver signals, said sampler sampling the first and second receiver signals at a sampling period determined by the spin rate so that said third and fourth receiver signals are approximately ninety degrees out of phase.

21. The system of claim 20, wherein the processor then calculates the yaw and pitch angles in a missile frame of reference and then uses the roll angle to calculate the yaw

and pitch angles in an earth frame of reference.

22. The system of claim 21, wherein said processor measures phase shifts between said first and second receiver signals and said third and fourth receiver signals to calculate the yaw and pitch angles in the missile frame of reference.

23. A method for tracking the attitude of a rotating projectile, comprising:

transmitting first and second linearly polarized transmit signals in phase coherency at first and second different frequencies from positions spaced apart by a distance d' on the projectile;

transmitting third and fourth linearly polarized transmit signals in phase coherency at third and fourth different frequencies from positions spaced apart by a distance d" on the projectile;

receiving and downconverting said first, second, third and fourth transmit signals at the projectile's launch platform to provide first, second, third and fourth receiver signals; and

processing said first, second, third and fourth receiver signals to calculate a roll angle, a pitch angle and a yaw angle.

24. The method of claim 23, further said first, second, third and fourth signals are transmitted from positions on first, second, third and fourth fins on the projectile, respectively.

25. The method of claim 24, wherein said second and fourth frequencies are second harmonics of said first and third frequencies, respectively.

26. The method of claim 23, wherein distances d' and d'' are approximately equal.

27. The method of claim 23, further comprising:

tracking the projectile from launch to maintain a line-of-site until at or near an intended target.

28. The method of claim 23, wherein the receiver signals are processed to measure phase shifts between said first and second receiver signals and said third and fourth receiver signals to calculate the yaw and pitch angles.

29. The method of claim 23, wherein processing the receiver signals comprising:

calculating the roll angle

calculating the yaw and pitch angles in a missile frame of reference; and

using the roll angle to calculate the yaw and pitch angles in an earth frame of reference.

30. The method of claim 29, wherein the phase shifts between said first and second receiver signals and said third and fourth receiver signals are measured to calculate the yaw and pitch angles in the missile frame of reference.